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MEMORANDUM

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To: The Ohio Manufacturers' Association (OMA)

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# PJM's Reliability Report Misses the Mark

## Key Points

- PJM did not clearly model market responses to supposed generation shortages. PJM's capacity auction price should send a pricing signal that spurs new investments in generation.
- PJM underplays a successful scenario they modeled that meets future power needs: more renewable energy and 9 Gigawatts of new natural gas generation.
- PJM's low-entry scenario is stacked with worse-case assumptions, leading to scares of a power shortage in 2027 and beyond.
- PJM's report overlooks nuances of challenges from the expansion of renewable energy, namely, that supplemental rapid-response power resources are needed.

## Summary

Pennsylvania Jersey Maryland Interconnection (PJM) is a regional transmission operator (RTO) of the bulk electric system. PJM is responsible for coordinating electric power generation in a multistate region which includes Ohio and is regulated by the Federal Energy Regulatory Commission (FERC) and federal laws. PJM is charged with ensuring enough power is always available for their entire geographic area, including for future years. PJM has markets and planning processes in place to ensure it procures enough power generation for the grid's peaks, plus an ample reserve margin. PJM's markets have successfully led to far more generation supply than demand, which in turn has driven down electricity prices and resulted in the retirement of the least economic, unneeded power plants.

On February 24, 2023, PJM issued its report "Energy Transition in PJM: Resource Retirements, Replacements & Risks", the third report in a series.[1] A main finding of the report was that there may be a lack of peak power available by the year 2027 in a "low entry" scenario, due to PJM's forecasted load growth exceeding their estimate of available power supply. Less discussed is that PJM modeled another scenario that showed no shortage in peak power.

In the report, PJM states that the key takeaway of their analysis is the need for their markets to attract new power generation. But PJM's focus on the worst-case scenario may tempt some policymakers to abandon

[1] "Energy Transition in PJM: Resource Retirements, Replacements & Risks", PJM Interconnection, Feb. 24th, 2023, energy-transition-in-pjm-resource-retirements-replacements-and-risks.ashx

competitive electric markets to address a power crisis, even though PJM is also demonstrating that power supply may be fine. State by state action to counter PJM's worst-case scenario could thus create more problems than it solves, as out-of-market subsidies or other non-market solutions may be enacted, an issue PJM has struggled with in the past.[2] Additionally, policymakers may conclude that "baseload" coal and nuclear plants require assistance, whereas in contrast PJM is demonstrating that more renewable energy and natural gas meets the grid's power needs.

PJM's report is thus creating its own systemic reliability risk, as it could encourage a set of policies, rules, and market designs that are dissonant with the successful scenario it modeled. Meanwhile, the reliability challenges emerging from renewable energy expansion are addressed by PJM's prior report in its series, though this report has not received as much public attention.[3]

Finally, PJM's President Manu Asthana says, "The capacity auction continues to be our best tool to ensure reliability at competitive prices in PJM." Thus, any potential shortfall in generation can be addressed by running a capacity auction. PJM has aimed to run the capacity auctions three years ahead of time to ensure reliability. So, real capacity shortages in 2027 would typically be known and addressed by this coming May 2024. Unfortunately, PJM delayed their capacity auction.

## PJM Did Not Clearly Model or Account for Market Responses

PJM understates its own role and set of tools to address real and perceived reliability needs. Most obviously, it is unclear if PJM is assuming electricity prices will stay low in a time of resource scarcity, or if it is assuming capacity and electricity prices will rise. PJM says it uses prices from the 2023/24 base residual auction for its forward-looking forecasts. But the capacity price in 2023/24 was very low - $34 /MW-day.[4] Elsewhere, PJM notes that if certain capacity prices are reached in the auction that it "signals that demand is willing to pay for the construction of new supply"[5]. For example, this has happened historically. PJM states that 23 GW of new natural gas generation began service between 2015 and 2018, a period of time that had an average PJM capacity price of $114/MW-day.[6]

It follows to reason that if there is a supply shortage, as PJM modeled in its low-entry scenario, then capacity prices would increase. This price increase would attract new generators into the market, now having sufficient revenue to pay for construction, as well as attract existing load-side customers to participate in PJM's capacity market as a demand response resource.

In other words, PJM's capacity auction should be the means with which to address any perceived or real future supply shortage. Yet, PJM's report is silent on whether their capacity auction would work to procure enough supply in 2027 and beyond, and if not, why not. Table 1 below shows a recent history of PJM

[2] "FERC's December 2019 Order on State Subsidies", https://www.ohiomfg.com/wp-content/uploads/FERC-Order-on-State-Subsidies-Impact-to-Manufacturers-January-2020.pdf; https://www.utilitydive.com/news/pjm-proposes-to-end-ferc-mopr-policy-that-raised-prices-for-state-subsidize/599248/

[3] "Energy Transition in PJM: Emerging Characteristics of a Decarbonizing Grid", https://www.pjm.com/-/media/library/reports-notices/special-reports/2022/20220517-energy-transition-in-pjm-emerging-characteristics-of-a-decarbonizing-grid-white-paper-final.ashx

[4] "2023/2024 RPM Base Residual Auction Results", PJM, https://sdc.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/2023-2024/2023-2024-base-residual-auction-report.ashx

[5] "Energy Transition in PJM: Resource Retirements, Replacements & Risks", page 9.

[6] Calculated capacity price for the 2015-2018 calendar years from PJM base residual auction results.

capacity price and the procured reserve margin. It shows that every year PJM has procured far more power generation than its reliability target of about 15% reserve margin.[7] In other words, there has been a glut of power in PJM for years. PJM aims to conduct their auction three years in advance, to allow enough time to build new generation for future years. However, PJM has been habitually behind in running auctions, exacerbating reliability planning. PJM's surest way to evaluate whether there is a forthcoming power shortage is to run the capacity auction several years ahead of time, which it could do for years it is concerned with.

**Table 1: PJM Capacity Price and Reserve Margin**

| Final Zonal Net | | |
|---|---|---|
| Capacity Year | Capacity Price | Reserve Margin (%) |
| 2012/2013 | $ 16.46 | 20.5% |
| 2013/2014 | $ 27.73 | 19.7% |
| 2014/2015 | $ 125.99 | 18.8% |
| 2015/2016 | $ 136.00 | 19.3% |
| 2016/2017 | $ 59.37 | 20.3% |
| 2017/2018 | $ 120.00 | 19.7% |
| 2018/2019 | $ 164.77 | 19.8% |
| 2019/2020 | $ 100.00 | 22.4% |
| 2020/2021 | $ 76.53 | 23.3% |
| 2021/2022 | $ 140.00 | 21.5% |
| 2022/2023 | $ 50.00 | 19.9% |
| 2023/2024 | $ 34.13 | 20.3% |
| 2024/2025 | $ 28.92 | 20.4% |
| 2025/2026 | Auction Not Yet Run | |
| 2026/2027 | Auction Not Yet Run | |
| **Total Average** | **$ 83.07** | **20.5%** |

To believe PJM's low entry scenario, one would need to believe that PJM's markets don't work, that they don't respond to fundamentals between supply and demand. In reality, if PJM experienced a power shortfall, then capacity prices would increase attracting new generation.

## PJM's Success Scenario: More Renewable Energy and Natural Gas Power

PJM's report presents a scenario that successfully meets 2030's power needs: a reasonable amount of additional renewable energy and nine megawatts of additional natural gas power. PJM calls this a "high new entry" scenario, even though its assumptions are reasonable. Interestingly, the report never plainly states that power needs can be met in 2030, though this is indeed the finding in the report for the high new entry scenario. Instead, PJM opaquely states that under this scenario, a "timing mismatch is avoided" and that "resource adequacy would be maintained". Both these statements mean that under this scenario, there will be no power shortages in 2030.

[7] "2022 PJM Reserve Requirement Study: PJM Resource Adequacy Planning", 2022-pjm-reserve-requirement-study.ashx, pg 8 - PJM recommends reserve margin of 14.9% to 14.7% for 2023 through 2027.

## How reasonable is this scenario where power needs are met?

First, in PJM's low-entry crisis scenario, PJM assumes no new natural gas power plants will be built after its 2023/24 delivery year, a delivery year we are presently in. In other words, in PJM's crisis scenario, they are assuming no new natural gas plants will come online from today through 2030. To maintain power, PJM estimates that 9 GW of new natural gas is needed by 2030. Much more than this is in PJM's interconnection queue - 13.8 GW. And 12 GW of this already has an interconnection service agreement. Moreover, PJM's own Clean Attribute Procurement Senior Task Force found gas power expansion to be economic and competitive. So more than 9 GW of natural gas power is economic, competitive, and has an interconnection service agreement from PJM. Assuming none of this generation will become available, as PJM does in its low-entry scenario, is an overly conservative assumption.

| PJM Needs | PJM Has | PJM Assumed |
|---|---|---|
| **9 GW** | **14 GW** | **0 GW** |
| Of New Natural Gas Plants by 2030 | Of New Natural Gas Plants in Queue | Of New Natural Gas Plants by 2030 |

Secondly, in PJM's low-entry scenario, they assume very little renewable energy will be built after 2026, only that which is in its interconnection queue.[8] However, it is well known that PJM has halted review of renewable energy interconnections for several years.[9] As a result, renewable energy companies have fewer reasons to plan that far out in PJM since they may be waiting for their existing projects to get through PJM's bottlenecked interconnection process. It's likely not realistic of PJM to assume that the rate of renewable energy deployment will slow significantly after 2026. PJM used the S&P forecast of new renewable energy after 2026 in its high-entry scenario where the modeled that power needs can be met.

Given this information, instead of framing PJM's "high new entry" scenario as an extreme, unlikely scenario, PJM could have acknowledged its reasonableness and likelihood of meeting 2030's power needs.

## PJM's Low-Entry Scenario is Stacked with Questionable Assumptions

PJM's low-entry scenario is a worst-case scenario. On scrutiny, some of PJM's assumptions seem reasonable, while others seem implausible. Table 2 presents some of the problematic assumptions from the PJM report.

[8] "Energy Transition in PJM: Resource Retirements, Replacements & Risks", page 12.
[9] Renewables backlog plan for PJM region met with mixed reviews - E&E News by POLITICO (eenews.net), https://www.eenews.net/articles/renewables-backlog-plan-for-pjm-region-met-with-mixed-reviews/

**Table 2: PJM Reliability Report's Questionable Assumptions**

| Issue | Low Entry Scenario | High Entry Scenario | Note |
|---|---|---|---|
| New gas generation | 0 GW new gas generation | 9 GW of new gas generation | 13.8 GW in PJM interconnection queue, 12 GW with interconnection service agreement. |
| New utility scale renewable energy | Very little renewable energy after 2026 | S&P forecast | Renewable energy to be built after 2026 would not be in PJM's interconnection queue; S&P forecast is a more reliable estimate. |
| Capacity price | $34 /MW-day, a 10-year low, for all future years | Same as Low Entry Scenario | PJM is claiming a capacity price due to a power glut would persist in times of scarcity, and new generation would not be attracted to the market. But power scarcity would result in higher capacity prices, attracting new generation. |
| Demand response resources | No effect | No effect | PJM overlooks demand response resources as a solution to both its supply and demand issues. These resources have a low cost of entry to participate in PJM markets. |
| Federal spending from IRA and IIJA laws | No effect | No effect | IRA and IIJA spending of $ billions on renewable energy, batteries, and efficiency is likely to create additional generation. |
| On-line energy-only power plants | Some power plants provide energy, but no capacity | Same as Low Entry Scenario | PJM's assumption that power plants that remain operational for energy markets will not provide capacity, even in a time of critical scarcity, is questionable. |
| State standards reliability off-ramps | PJM assumes states have no reliability off-ramps, but didn't check | Same as Low Entry Scenario | States may have reliability "off ramps" for requirements for certain plants to close. |
| EPA Good Neighbor Rule | Plants fail to invest in NOx control, 4,400 MW retires | Same as Low Entry Scenario | PJM did not evaluate whether power scarcity, and thus higher electricity prices, would make NOx control investments economical. |

## PJM's Report Overlooks Renewable Energy's Need for Supplemental Rapid-Response Power

Policymakers and manufacturers should know that real challenges exist with the rapidly transforming electricity sector. These challenges could grow into reliability issues that have serious consequences. Our critique of PJM's report does not mean all is well, nor is it meant to dismiss reliability concerns. Real challenges to reliability in the electric sector, unaddressed in PJM's report, include:

- Transmission system reliability - Notably, the June 2022 power outage in central Ohio showed that even with sufficient generation available, cascading system outages can still occur. It highlighted multiple planning and operational failures of AEP Ohio, AEP Transmission, and PJM. Yet, there has been no independent investigation or fact-finding from PJM, the PUCO, or the Ohio General Assembly. Policymakers should consider requiring the PUCO to open an independent investigation into the June 2022 outages.

- Winter peak reliability - 2022's Winter Storm Elliot was a near miss for PJM's grid.[10] Electric system failures during times of extreme cold are incredibly dangerous and costly. Extreme weather has impacted all types of generation. Clearly, PJM needs market reforms focused on cold- and extreme-weather performance. Yet, given the chance to reform its capacity market to include pricing for winter peaks, PJM declined.[11] The winter peak problem could worsen - electrification of space heating equipment is well underway and likely to accelerate, which will increase winter peaks.

**Key Information**

- June 2022 central Ohio power outage should be independently investigated.
- Winter grid peaks need attention.
- Extreme weather needs prepared for.
- Renewable energy requires rapid response supplemental power, not baseload.

- Renewable energy needs rapid-response supplemental power - PJM's reliability report focuses on capacity market needs. However, the capacity market functions to address system peaks, such as hot summer afternoons. But, as renewable energy expands, PJM will begin experiencing the "duck curve" or "canyon curve" effect, which is the need for rapid-response power resources that can ramp down and up in the shoulder hours of renewable energy generation. This likely means that there will be more power resources that are paid through the ancillary service and energy markets, markets designed to address power needs on short time intervals. While PJM's report focuses on the capacity market, ancillary services and energy markets may be where reliability issues are to be addressed in the future. PJM's prior report in its Energy Transition series addresses these issues well.[12]

[10] "Winter Storm Elliot, Event Analysis and Recommendation Report", 20230717-winter-storm-elliott-event-analysis-and-recommendation-report.ashx (pjm.com)
[11] "Overview of PJM Proposals", 20230814-item-03a---cifp---pjm-proposals.ashx; 20231013-pjm-files-changes-to-capacity-market-to-promote-reliability.ashx
[12] "Energy Transition in PJM: Emerging Characteristics of a Decarbonizing Grid", https://www.pjm.com/-/media/library/reports-notices/special-reports/2022/20220517-energy-transition-in-pjm-emerging-characteristics-of-a-decarbonizing-grid-white-paper-final.ashx